produced in the same way. The cell-plate, like the peripheral layer of the protoplasm of a young pollen-grain, contains microsomata which disappear, and it is then converted into a plate of cellulose. Finally, the successive layers of a starch-grain are produced by the alteration into starch of layers of proteid-substance derived from the starch-forming corpuscle (amyloplast).

Besides dealing thoroughly with these main points, Prof. Strasburger touches upon others which are also of great importance. He points out that the starch which makes its appearance in the chlorophyll-corpuscles under the influence of light, is derived from the proteid of the corpuscles by dissociation. The formation of this starch is therefore not the immediate product of the synthetic processes going on in the chlorophyll-corpuscles, but only a mediate product. The processes in question produce proteid. Prof. Strasburger is inclined to accept Erlenmeyer's hypothesis, that methyl aldehyd is formed in the chlorophyll-corpuscles from carbonic dioxide and water, and to believe that by polymerisation a substance is produced which can combine with the nitrogenous residues of previous dissociations of proteid to reconstitute proteid. He does not agree with the suggestion of Loew and Bokorny that the methyl aldehyd may combine with ammonia and sulphur to form proteid *de novo*.

Lastly, Prof. Strasburger makes an interesting suggestion as to the probable physiological significance of the nucleus. He points out that the nucleus cannot be regarded as regulating cell-division, for instances are known of cell-division taking place without previous nuclear division, and, conversely, of nuclear division taking place without cell-division. He is of opinion that the nucleus plays an important part in the formation of proteid in the cell. This view is founded upon the facts that one or more nuclei have been found to be present in the vast majority of plant-cells, that the nucleus is, as a general rule, the most persistent protoplasmic structure, and that it gives the various proteid reactions in a very marked manner.

SYDNEY H. VINES

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

The Behaviour of Sulphate of Lead in a Secondary Battery

SINCE the meeting of the British Association at Southampton I have made several experiments on the action of sulphate of lead at the negative pole of a decomposition cell, with a view to ascertain, not whether the sulphate was reduced in bulk by the action of the nascent hydrogen, a matter concerning which I had satisfied myself before in the negative, but the less practically important matter whether any *trace* of metallic lead could be obtained upon the negative plate by this action.

I used, therefore, platinum electrodes, immersing them in a paste of sulphate of lead in dilute sulphuric acid. And at the suggestion of Prof. McLeod, in order to obtain sulphate pure and in a fine state of subdivision, I precipitated a quantity from dissolved carbonate.

The paste soon settled down, leaving about a quarter of an inch of clear liquid above it, which was decanted off. Small thick platinum plates stood in the paste about 2 inches apart, and were connected with either three or two Lechlanché cells. When three cells were used, the evolution of gas from both plates speedily scooped out a hole round each filled with only turbid liquid, which was kept agitated by the bubbles.

Under these circumstances a distinct darkening of both plates occurred, and after a day or two they showed a distinct though extremely thin coating of peroxide and of metallic lead respectively. Prof. McLeod had tried the same kind of experiment, and noticed that the darkening occurred more readily on portions of the plate in contact only with free liquid than on those imbedded in paste.

I therefore re-embedded my plates, and employed only two cells to charge them, so that the bubbles might not have power enough to remove the paste from contact with the plates at all parts; under these circumstances the growth of peroxide of lead at the + plate was abundant, so much so that when the plate was ultimately pulled out, it left a black mass behind it, which had penetrated into the white paste; but the growth of the metallic lead on the − plate was even less perceptible than before, and it was evident that the metallic lead was better deposited from the solution than from the paste. It seemed probable, therefore, that though the sulphate is extremely insoluble in dilute acid, yet that a sufficient trace was dissolved to be acted on by the hydrogen, and that as fast as this was decomposed more was dissolved from the large quantity of solid present, provided the liquid was free to circulate and become replenished.

To test this further, I first made a saturated solution of sulphate of lead in the acid, by shaking and stirring it up with the finely divided precipitate for many hours—though ordinary dilute sulphuric acid is probably perfectly saturated without any such treatment—and then electrolysed the clear solution. No effect is ordinarily perceived under these circumstances, and I could perceive none. Hence the quantity dissolved at one time must be something infinitesimal; and it is able to give no appreciable deposit, unless fresh solid is present to replenish it.

Next I took a vessel full of the sulphate paste, but with a third of an inch clear liquid standing above it; and into this clear liquid I dipped the platinum plates, barely letting them touch the pasty mass below. In this position they remained several days connected to two Leclanchés, and the result was a distinct blackening of the − plate with a deposit of metallic lead from the solution; but the + plate scarcely seemed to receive any deposit of peroxide except along its bottom edge, which probably just touched the paste, and which showed a narrow line of deep puce colour. The observation that the − plate received its deposit more easily from the free solution than from the paste, had been previously made by Prof. McLeod. But to get the deposit most quickly, it is best to immerse the plates in the paste, and to cause sufficient gas to be evolved to keep them free from actual contact with it; while at the same time the solution surrounding them is so near a large surface of paste, that it can be very rapidly replenished.

On neutralising the acid with ammonia, so that ammoniacal salts and common salt might be present, in which sulphate of lead is known to be somewhat soluble, the deposit of metallic lead went on with far greater rapidity.

I have subsequently repeated the experiments with a paste of ordinary sulphate of lead, and the results appear to be quite the same. A week's deposit could be dissolved off the negative platinum plate with a single drop of nitric acid, and could only be made to show a faint precipitate when sulphuric acid was added to this solution in a watch-glass.

Moreover, unless the plate were rinsed on extracting it from the paste, the small amount of sulphuric acid clinging to it was sufficient to so whiten the deposit in the course of a night as to make it seem almost as if it had disappeared.

The matter is rather a small one to write so much about, but the behaviour of sulphate of lead in secondary batteries is really of considerable importance, and is at the bottom of a great many of the difficulties which one meets with in practical operations with secondary lead cells.

Moreover, it is only due to Dr. Gladstone that I should say how far I have been able to obtain his results; and he will perceive that if all he asserts is that platinum electrodes do show a nearly infinitesimal tarnish of metallic lead (as I understood him to say at Southampton), then my experience agrees with his. But I think that this is merely due to the partial solubility of the sulphate; and I never find that the reduction is able to spread through the paste in the slightest degree, in such a way

as to have any practical bearing on the behaviour of a secondary battery. OLIVER J. LODGE

University College, Liverpool.

On the Conservation of Solar Radiation

IT appears to me a difficulty arises with regard to Dr. Siemens' theory when we consider the original condition of the earth and of the other planets. What, in fact, has become of the great amount of energy which was present in the form of heat in those bodies?

Just as in the case of the sun, the rotation of the earth would produce a continuous cycle current, the decrease of rotatory energy being perhaps counterbalanced by shrinkage, the radiant heat would become transformed into the potential energy of dissociation, and this energy again would be given back to the earth in the form of heat in another part of the circuit where the elements recombine. Now it is quite impossible that the whole of the heat radiated should be used in this way, for after a lapse of years we should find a considerable diminution of potential, or (perhaps) rotatory energy, and we therefore should be forced to the conclusion that the earth became continually hotter. Hence some of the radiant heat escaped must have escaped into space, never to return.

Is it then a feasible solution that more heat is radiating from the sun than is necessary for the dissociation of the elements? If so, then at least we should have a satisfactory explanation of its slowly-diminishing activity. G. B. S.

THE writer of this letter is right in concluding that in accordance with my hypothesis the earth also must throw out a stream of matter equatorially into space; and if your correspondent will refer to my article in the *Nineteenth Century* of April last, he will find that at p. 522 I speak of such a terrestrial outflow, with which I connect the phenomena of Aurora Borealis. If at any period of the world's history the rotatory velocity of the earth has been much greater than it is now, and its surface-temperature sufficiently high to cause ignition of combustible gases, it may be reasonably supposed that it had the power of recuperating its heat of radiation. The amount of heat so recuperated would, under all circumstances, be less than that received back by combustion, and the result of gradual diminution of temperature would be that on a certain day the temperature must have fallen below the point of ignition, from which day forward no further recuperation of heat could be expected. The process of cooling would then proceed at a very rapid ratio, until the surface-temperature had reached another point of comparative constancy, at which the radiation into space was balanced by the heat received by solar radiation, and which is our present condition. C. W. SIEMENS

12, Queen Anne's Gate, S.W., October 16

The Great Comet and Schmidt's Comet

THERE can be no doubt of the elongation of the nucleus of the Great Comet in the direction of the axis of the tail, in which direction it is three times as long as in a direction at right angles thereto.

The place of the comet this morning, at 6h. 0m. G.M.T., was

R.A. = 10h. 18m. 53 ± 5 secs.
P.D. = 103° 31′ 35″ ± 10″.

A neighbouring object was carefully observed, through haze, as a star of reference; its place was

R.A = 10h. 18m. 53s.
P.D. = 102° 30′ 0″

On consulting the Catalogue, it appears there is no star in this place. The object observed was probably Schmidt's Comet, discovered on the 8th of this month, but not since heard of here.

Unfortunately the above are absolute, not differential measures, but they have been corrected by measures of λ Draconis, also observed as a star of reference; its place is

R.A. = 10h. 4m. 46s.
P.D. = 101° 46′ 27″.

WENTWORTH ERCK

Sherrington House, Bray, October 16

[The nearest bright star to Mr. Erck's place is L. 20158, 6·7 mag. in Gould; R.A. for 1882, 10h. 17m. 32s., N.P.D. 102° 47′. λ Draconis is evidently a slip of the pen for λ Hydræ.—ED.]

The B.A. Unit

I WISH to call the attention of readers of NATURE who are interested in the experiments which have recently been made for the determination of the B.A. unit of resistance, to a paper by F. Kohlrausch, read before the Academy of Sciences at Göttingen, September 6, 1882, "On the Measurement by Electrical means of the mean Area of the windings of a Coil." Prof. Kohlrausch has applied his method to redetermine the mean area of the coils of the earth inductor used by him in his experiments on the value of the B.A. unit in 1874. He finds the area of this coil to be 387,200 sq. cm.; the value used in 1874, calculated from the geometrical measurements of Weber in 1853, was 392,800 sq. cm. In consequence the value of the B.A. unit as determined from his experiments requires alteration, and, making the necessary corrections, Prof. Kohlrausch obtains

1 B.A. unit = ·990 × 10^9 $\frac{\text{cm.}}{\text{sec.}}$, agreeing much more nearly

with the values found by Rowland, Rayleigh and Schuster, and myself. R. T. GLAZEBROOK

Trinity College, Cambridge, October 13

The African Rivers and Meteorology

THINKING that the following extract from a letter written from the Niger Delta may be of interest to your readers, I beg leave to offer it for insertion.

"As yet there has been little water in the Niger, the rise up to the present (August 29) has not been over 3 feet in the lower river, and they say no rise has taken place in the upper river as yet. The upper river commences at Locayo, or where the Benue or Chadda joins the Niger, and continues thence on to Timbuctoo. So far as I can foresee, there will be a famine in the Niger Valley this year, as there has been a complete failure of the first crop from drought, and there has been no chance of putting in the second crop for the same reason."

The regimen of the waters of such great rivers as the Nile, the Niger, and the Congo, both as to quantity and periods of rise and fall, must be closely related to the meteorological conditions of the highlands of Africa, so little known to us, so extensive, and as yet so inaccessible for observation. May it not, therefore, be assumed that the comparative and continuous study and observation of those rivers as regards their volumes and periods of rise and fall, would be likely to furnish most valuable data for the prediction or forecast of weather in Europe. Thinking so, I have suggested to my correspondent the advisability of keeping a systematic record of the rise of the river Niger, and, if possible, of the temperature and other conditions of the water, with a view to their utilisation for meteorological purposes, and from this point of view I have thought that the above communication may present some interest. J. P. O'REILLY

Royal College of Science for Ireland, Dublin, October 13

A "Natural" Experiment in Complementary Colours

YESTERDAY evening I was reading Goethe's account of his visit to the falls of Schaffhausen ("Journey to Switzerland in 1797"). After mentioning that the morning was a misty one, and describing the general effect of the cataract, he adds: "Wenn die strömenden Stellen grün aussehen, so erscheint der nächste Gischt leise purpur gefärbt." I had certainly never heard of this phenomenon before, but it naturally occurred to me that it was probably an effect of complementary colours. Less than two hours afterwards I opened NATURE for the week, and found precisely the same phenomenon, with the same explanation as given by Mr. C. T. Whitmell. The point is interesting, as giving testimony to Goethe's close and accurate observation of colour phenomena; while the coincidence involved seems also to be worth recording. WALTER R. BROWNE

October 13

Ventilation of Small Houses

I HAVE been much interested in the reports of the Sanitary Institute. May I call attention to the fact that the majority of the smaller houses in our large towns have no means of ventilation except through the rooms. There are no ventilators or staircase windows, and the back house door opens into the kitchen. In a three-storied house the staircase is lit by the fanlight over the front door and a skylight in the roof, neither of